CLAIMS

1. An integrated optical waveguide interferometer capable of detecting the amount of or changes in a stimulus of interest comprising:
a sensing waveguide capable of exhibiting a measurable response to a change in a localised environment caused by the introduction of or changes in the stimulus of interest, said sensing waveguide having a path of interaction of variable optical length.

2. An integrated optical waveguide interferometer as claimed in claim 1 further including:
one or more sensing layers capable of inducing in the sensing waveguide a measurable response to a change in the localised environment caused by the introduction of or changes in the stimulus of interest.

3. An integrated optical waveguide interferometer as claimed in claim 2 further comprising:
an inactive waveguide in which the sensing layer is substantially incapable of inducing a measurable response to a change in the localised environment caused by the introduction of or changes in the stimulus of interest.

4. An integrated optical waveguide interferometer as claimed in any preceding claim wherein the variation in optical length of the path of interaction is sufficient to ensure a variation in phase change caused by the introduction of or changes in the stimulus of interest of $<2\pi$.

5. An integrated optical waveguide interferometer as claimed in any preceding claim wherein the path of interaction is stepped.

6. An integrated optical waveguide interferometer as claimed in any preceding claim wherein the path of interaction is of dual optical length.

7. An integrated optical waveguide interferometer as claimed in claim 6 wherein the difference in dual optical length is sufficient to ensure a difference in phase change caused by the introduction of or changes in the stimulus of interest of $<2\pi$.

8. An integrated optical waveguide interferometer as claimed in any preceding claim wherein the variation in optical length of the path of interaction is provided by a variation in its geometrical length.

9. An integrated optical waveguide interferometer as claimed in claim 8 wherein the variation in geometrical length is sufficient to ensure a variation in phase change caused by the introduction of or changes in the stimulus of interest of $<2\pi$.

10. An integrated optical waveguide interferometer as claimed in claim 8 or 9 wherein the geometrical length of the path of interaction is stepped.

11. An integrated optical waveguide interferometer as claimed in claim 8, 9 or 10 wherein the path of interaction is of dual geometrical length.

12. An integrated optical waveguide interferometer as claimed in claim 11 wherein the difference in dual geometrical length is sufficient to ensure a difference in phase change caused by the introduction of or changes in the stimulus of interest of $<2\pi$.

13. An integrated optical waveguide interferometer as claimed

in claim 8 or 9 wherein the variation in the geometrical length of the path of interaction is continuous.

14. An integrated optical waveguide interferometer as claimed in claim 13 wherein the path of interaction has a gradient.

15. An integrated optical waveguide interferometer as claimed in any of claims 1 to 7 wherein the variable optical length of the path of interaction is provided by a variation in its refractive index.

16. An integrated optical waveguide interferometer as claimed in claim 15 wherein the refractive index is varied intrinsically by varying the composition of the material of the sensing waveguide.

17. An integrated optical waveguide interferometer as claimed in claim 16 wherein the sensing waveguide is composed of two or more discrete portions of material of differing composition.

18. An integrated optical waveguide interferometer as claimed in claim 16 or 17 wherein the sensing waveguide is of dual composition.

19. An integrated optical waveguide interferometer as claimed in claim 15 wherein the refractive index is varied dimensionally.

20. An integrated optical waveguide interferometer as claimed in claim 19 wherein the refractive index is varied dimensionally by varying the thickness of the sensing waveguide.

21. An integrated optical waveguide interferometer as claimed

in claim 19 or 20 wherein the sensing waveguide is of dual thickness.

22. An integrated optical waveguide interferometer as claimed in any preceding claim further comprising a capping layer adapted to define the path of interaction of variable optical length.

23. An integrated optical waveguide interferometer as claimed in claim 22 wherein the capping layer incorporates a window which bounds the localised environment.

24. An integrated optical waveguide interferometer as claimed in claim 23 wherein the window bounds a medium so that the capping layer defines a path of interaction of at least dual optical length in which a first part of a modal field interacts with the medium in the window and a second part of the modal field interacts with the medium of the capping layer.

25. A process for determining the absolute status of an integrated optical waveguide interferometer, said process comprising:
(A) providing an integrated optical waveguide interferometer as defined in any preceding claim;
(B) irradiating the integrated optical waveguide interferometer with electromagnetic radiation;
(C) introducing to the localised environment a stimulus of interest;
(D) measuring the variation in phase shift of the modal field interacting with the path of interaction; and
(E) calculating from the variation in phase shift the absolute status of the integrated optical waveguide interferometer.

26. A process as claimed in claim 25 wherein the variation in

phase shift caused by the introduction of or changes in a stimulus of interest is <2π.

27. A process as claimed in claim 25 or 26 comprising:
(A1) providing an integrated optical waveguide interferometer as defined in any of claims 1 to 22, wherein the path of interaction is of dual optical length;
(B) irradiating the integrated optical waveguide interferometer with electromagnetic radiation;
(C) introducing to the localised environment a stimulus of interest;
(D1) measuring the difference in phase shift of the first and second parts of the modal field interacting with the path of interaction of dual optical length respectively; and
(E1) calculating from the difference in phase shift the absolute status of the integrated optical waveguide interferometer.

28. A process as claimed in any of claims 25 to 27 wherein the difference in phase shift caused by the introduction of or changes in a stimulus of interest is <2π.

29. A process as claimed in any of claims 25 to 28 further comprising:
(F) relating the absolute status to the amount of or changes in the chemical stimulus of interest.

30. A method for determining the absolute calibration status of an integrated optical waveguide interferometer as defined in any of claims 1 to 22, said method comprising:
(A) providing the integrated optical waveguide interferometer as defined in any of claims 1 to 22;
(B) irradiating the integrated optical waveguide interferometer with electromagnetic radiation;
(C) measuring the variation in phase position of the modal

field interacting with the path of interaction; and
(D) calculating from the variation in phase position the absolute calibration status of the integrated optical waveguide interferometer.

31. A method as claimed in claim 30 comprising:
(A1) providing an integrated optical waveguide interferometer as defined in any of claims 1 to 22, wherein the path of interaction is of dual optical length;
(B) irradiating the integrated optical waveguide interferometer with electromagnetic radiation;
(C1) measuring the difference in phase position of the first and second parts of the modal field interacting with the path of interaction of dual optical length respectively; and
(D1) calculating from the difference in phase position the absolute status of the integrated optical waveguide interferometer.

32. A method as claimed in claim 30 or 31 wherein steps (A) to (C) are performed at start-up.